Environmental Justice Analysis of Clean Up Standards for Lead in Residential Soil at Mine and Smelter Sites

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Investigation of Clean Up Standards For Lead In Residential Soil At Mine Sites

Introduction

Smelters and abandoned mine sites from the West's hard rock mining era are a common feature in the states of Colorado, Utah, Wyoming, South Dakota, and Montana. These sites is often characterized by complex hydrology, fragile alpine ecosystems, remote location and high background levels of lead in soil, especially in areas with high rates of disturbance.

Administratively, clean up of abandoned mine sites and smelters are characterized by complicated patterns of ownership, state, local and federal conflict over clean up levels, and, in some cases, the unique culture of historic mining towns and communities. Often, these communities enjoyed a resurgence as hubs for employees in the service sector, an important part of the economy in the "urban" West, driven by the winter ski and summer resort industry. Consequently, some of these communities have seen increases in minority and/or low-income populations. Amenities, services and infrastructure to support these populations are often lacking.

Communities around mining sites sometime lack political power, economic means, or awareness of rights and opportunities to participate in environmental decision making. Several studies, including a study by the General Accounting Office have found correlations between the siting of hazardous waste landfills and the ethnicity of the host communities. As a result of these studies, several subsequent events eventually led to an Executive Order on Environmental Justice. This order encourages EPA to focus attention on human health and environmental conditions in low-income and minority communities and to foster non-discrimination in federal programs that substantially affect human health or the environment.

Given this background, it is important to understand whether low-income and/or minority communities in Region VIII near superfund sites are benefitting from the clean up of abandoned mine and smelter sites in the same way as the majority population. Twelve sites across Colorado, Montana and Utah were examined to determine whether disparities exist in clean up levels for lead in residential soil at smelter and mining sites adjacent to or surrounded by minority and low-income communities.

Site records such as Records of Decision (RODs) and Action Memos were used to determine which sites meet the project's criteria. Various decision documents reviewed the and interviews performed with Remedial Project Managers, Risk Assessors, and Community Involvement Coordinators. This information helped to identify the following factors for each site: background levels of lead in soil; clean up levels for lead in residential soil; racial and the economic composition of potentially impacted communities which could result in a higher exposure to lead for low-income and/or minority populations.

What is Environmental Justice?

Environmental Justice (EJ) means the fair treatment of people of all races and incomes with respect to the development, implementation, and enforcement of environmental laws,

regulations and policies. Fair treatment implies that no person or group of people should shoulder a disproportionate share of negative environmental impacts resulting from the execution of environmental programs.

It is important that communities have an opportunity to be involved in and offer input concerning environmental activities that may impact their lives, health and environment. The EJ movement was born out of community activism long before it was formally recognized by the federal government.

EJ is both a regional and national priority, and an integral part of Region VIII's mission. The purpose of this report is to determine if, programmatically, minority and low-income communities face a disproportionate impact from lead in residential soils at Superfund sites.

When evaluating sites/cases for environmental justice there are four principal criteria to consider.

Environmental Justice...Some Questions To Ask

Demographics	**Disproportionate Impact**
● What are the demographics of this community? % Minority____ State Average_____ % Low-Income____ State Average_____ ● Are there other questions/insights or other demographic indicators that are important (i.e., percent children, elderly)?	● Describe any actual or potential adverse health or environmental impacts. What evidence exists to support these impacts? ● Are environmental laws being complied with?
Stakeholder Involvement	**Benefits And Burdens**
● How has information been made available to the community? What opportunities has the community had to participate? ● Were all potentially affected parties heard from and how were representatives selected? ● To what degree did the community influence the decision making?	● What benefits or burdens, direct or indirect - economic, social, cultural, environmental, health - will result or will come from the proposed action and to what stakeholder group(s)?

Interpreting the Demographic Charts

The demographics for each site and community were determined by using data from the 1990 US Census. The charts (see Appendix A) presented in this report illustrate the percent minority and percent poverty for the population within a one mile radius of each site and lead Action Levels for each site. U.S. Census data on the block group level was used to determine demographics. Each Block group consists of approximately 250 to 400 houses, providing detailed information that it is representative of local populations. The data profiled in the charts represents demographic information from block groups that either intersect or fall within a one mile radius of a particular site. The statistics are given for only that percentage of the block group

that falls within or intersects the radius.

If the community was 25 percent higher than the state average for either race or income it was considered to be a potential EJ community. To determine if environmental justice was a consideration in clean up levels, we compared state averages of percent minority and percent low income populations to the corresponding statistics for each site.

Definition of Terms

Block Group - Small areas bounded by features such as streets, streams and city or town boundaries defined by the U.S. Census Bureau. Block groups generally contain between 250 and 550 housing units, with the ideal size being 400 housing units. Block groups are generally smaller units than census tracts.

Minority Percentages - The proportion of persons who considered themselves any race or ethnicity other than white. Minority is defined as all non-white groups, including all Hispanic groups.

Poverty Percentages - The proportion of persons in a given area who are living below the poverty income thresholds as established by the U.S. Census Bureau in 1990.

Mining Sites with Elevated Residential Soil Lead Levels

Colorado
Asarco Globe Plant, Inc.
California Gulch
Eagle Mine
Smeltertown
Smuggler Mountain

Montana
Anaconda Company Smelter
East Helena
Silver Bow Creek/Butte Area

Utah
Kennecott South
Murray Smelter
Midvale Slag
Richardson Flats
Sandy Smelter
Sharon Steel Corp.

Site Specific Action Levels and Demographics

SITE NAME	ACTION LEVEL	% MINORITY	% POVERTY
State of Colorado		**19.1**	**11.4**
ASARCO Globe Plant	500 ppm	67.9	33.9
California Gulch	3500 proposed level	25.5	9.4
Eagle Mine	No action level established*	63.7	2.8
Smeltertown	500 ppm	11.3	15.6
Smuggler Mountain	1000 ppm	7.1	6.7
State of Montana		**8.1**	**15.6**
Anaconda Company Smelter	Level set for Arsenic	5.9	9.1
East Helena	1000 ppm	3.1	8.2
Silver Bow Creek/Butte Area	2000 ppm	4.1**	.82**
State of Utah		**9**	**11**
Kennecott South	1100 -2500 ppm	9.4	10.7
Midvale Slag	650 ppm	18.2	18.4
Murray Smelter	1200	7.3	9.7
Richardson Flats Tailings	No action level established*	4.0	5.4
Sandy Smelter	1400	11.9	14.5
Sharon Steel Corporation	500	15.1	15.5

* No action level established because lead was not found to be a public health threat.

** Data taken from the "Summary Report of Demographic and Socioeconomic Makeup of Communities in Proximity to NPL Sites."

Conclusions

Although no statistically significant conclusions can be drawn from this study, because of the small sample size, review of the bar charts and graphs suggested that there are no apparent disparities in clean up levels for lead in residential soils at Superfund smelter and mine sites when those sites include minority and low-income communities. Distinct cultures, varied levels of community involvement, local, federal and state conflict over clean up levels, evolving guidance standards, increased knowledge of risk factors, as well as unique site specific characteristics all play a role in how clean up levels are decided.

CLEAN UP LEVELS FOR POTENTIAL ENVIRONMENTAL JUSTICE SITES AND NON ENVIRONMENTAL JUSTICE SITES

State	EJ Sites	Action Levels	Non EJ Sites	Action Levels
Colorado	Asarco Globe	500	Smeltertown	500
	California Gulch	3500	Smuggler Mountain	1000
	Eagle Mine	---		
Montana			Anaconda	---
			East Helena	1000
			Silver Bow Creek/Butte	2000
Utah	Midvale Slag	650	Kennecott South	1800*
	Sandy Smelter	1400	Murray Smelter	1200
	Sharon Steel	500	Richardson Flats Tailings	---
Average Action Levels (ppm)		1310		1250

* Midrange of the 1100-2500 action levels

Where no data are shown, no action level was chosen

The role of community participation can have a dramatic effect on how high or low an action level is set. The Leadville community at the California Gulch site and the Aspen community at the Smuggler Mountain site are both excellent examples of how the public can influence the decision making process. Although very different in their demographic makeup, both sites shared similar views about the clean up process. At both sites, the majority of community members felt that the lead in residential soil was not a serious threat to public health and thus lobbied against strict clean up levels and against soil removals. EPA recognized that a determinant factor in the success of a project is community acceptance and involvement and thus revised the proposed clean up standards for both sites. Per both communities' requests, initiatives such as blood lead monitoring programs and institutional controls were set in place to compensate for the substantial soil removal that would have otherwise been required.

The Superfund Program is still relatively young and guidance standards for setting lead clean up levels are continuously evolving as information and experience are gained. Not too long ago, 500 ppm was the standard action level for lead in residential soil. However, that number has been increasing in recent years. The date at which a site was listed and/or a remedy was recommended could contribute to the variation in clean up levels among the sites.

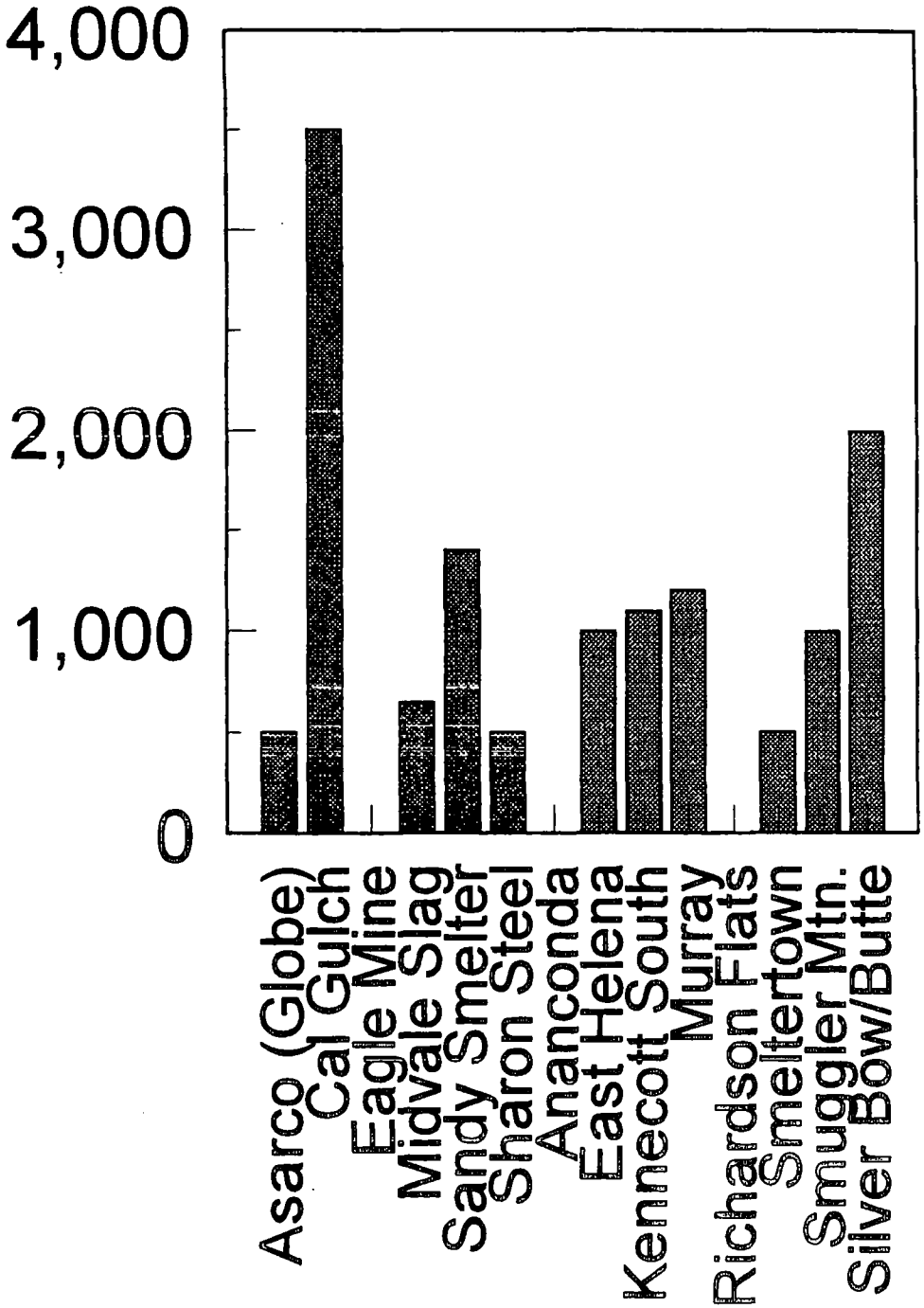
Today, risk assessment models are more likely to use site specific data rather than standardized generic data. This could also account for the range of clean up levels. Another factor contributing to the variation in clean up levels is the weight project managers place on model results. When making decisions, some project managers choose to include site characteristics such as the soil cover or vegetation to supplement model results. One example of this approach is the Murray Smelter site. At Murray, future land use, current soil cover, the use of institutional controls and results from blood lead level monitoring tests were combined with the risk assessment model results to determine an action level. The model by itself suggested an action level between 600 ppm and 1200 ppm. When the above-mentioned factors were combined with the model results an action level of 1200 ppm was chosen.

Comprehensive studies about how humans and children, in particular, absorb lead are also more readily available and better understood today. Several recent studies provide critical insight and point to higher action levels than those which were previously accepted.

Overall, each site provides unique challenges, characteristics and factors to consider when setting clean up levels. This study indicates that the variation and range of clean up levels is more likely due to these individual factors rather than environmental justice concerns.

APPENDIX A:
Demographic Charts

Comparison of Action Levels for Residential Soil Lead Levels



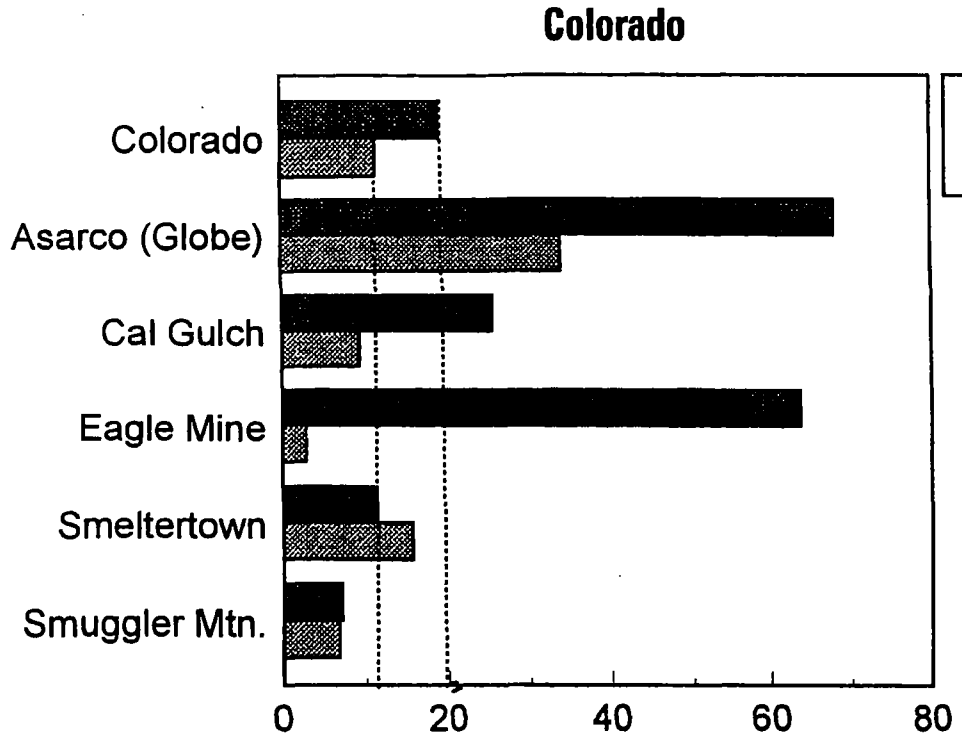
Action Level (No EJ)

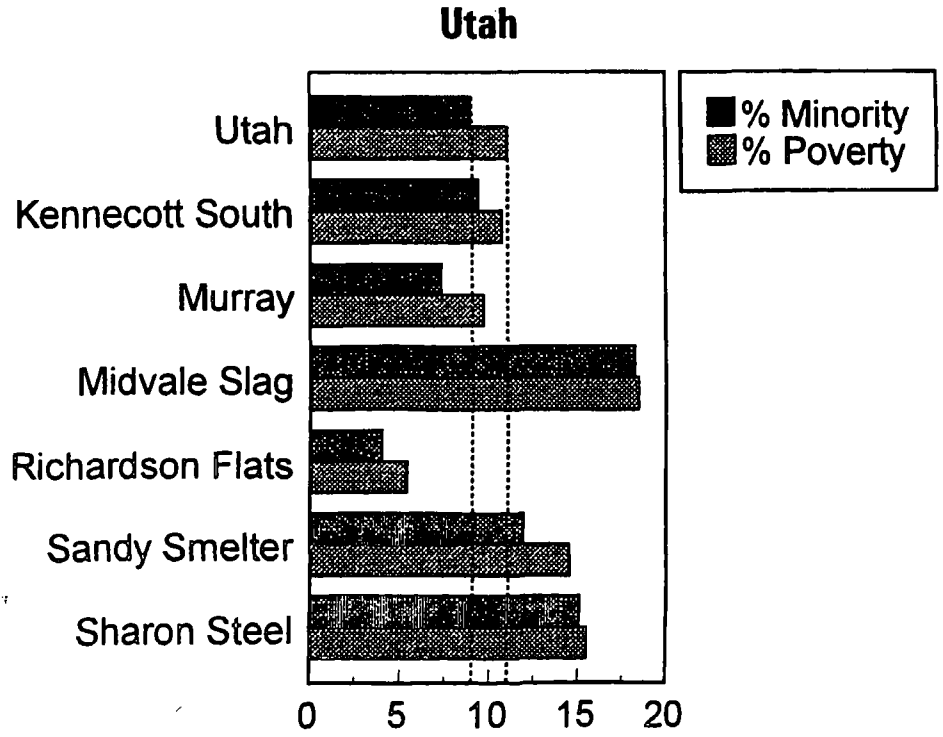
Action Level (Potential EJ)

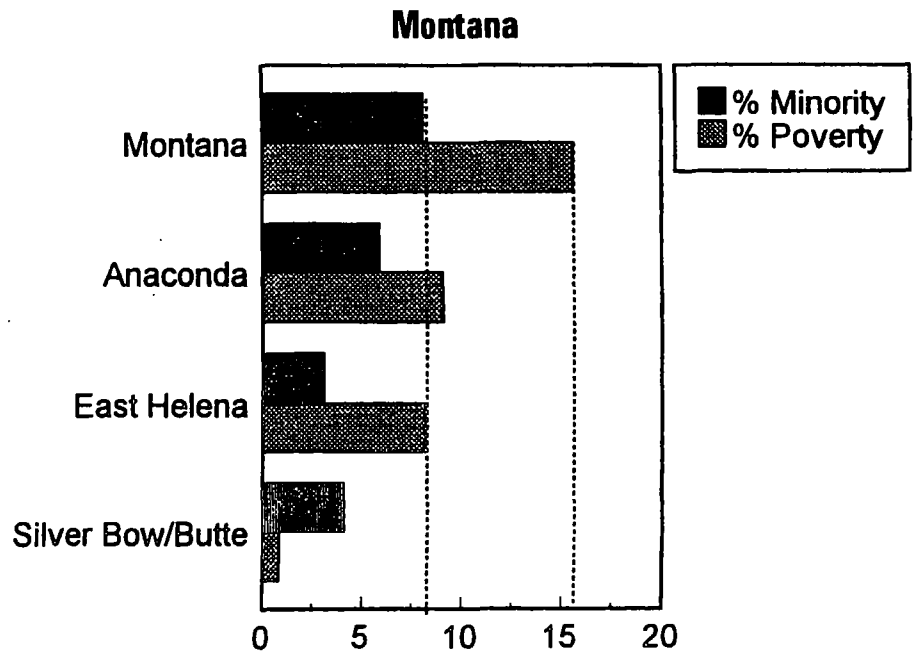
KEY

Anaconda	- Action Level Set for Arsenic
Richardson Flats	- No Action Level Set
Eagle Miine	- No Action Level Set

Comparison of Selected Sites to State Demographics







APPENDIX B:
Summaries of Mining and Smelter Sites

Introduction

The following summaries/ histories were compiled by reviewing the various decision documents such as Records of Decision (RODs, Action Memos and fact sheets. Interviews with Remedial Project Managers, Risk Assessors and Community Involvement Coordinators also served to supplement the written records availabe.

ANANCONDA COMPANY SMELTER (Ananconda, Montana)

Site Description

The Ananconda Company Smelter is located in southwestern Montana in Deer Lodge County. From 1884 until 1980 the smelter processed copper and other associated ores. Aerial emissions and stream discharges have scattered wastes with high concentrations of arsenic, copper, cadmium, lead and zinc over more than 65,000 acres of the Deer Lodge Valley area. Residential areas in the towns of Warm Springs, Anaconda, Opportunity and Mill Creek have all been affected by the smelter operations.

The large volume of wastes produced, and the wide area over which the wastes were dispersed prompted the site to be divided into smaller more manageable operable units to facilitate the clean up process. The Anaconda Smelter Site is currently organized into the following operable units: Anaconda Smelter Demolition (Smelter Hill); Mill Creek; Ananconda Yards Time Critical Removal Action; Old Works; Flue Dust; Community Soils; and Anaconda Regional Water, Soils and Waste.

In September of 1983, the Anaconda Smelter Site was listed on the National Priorities List and the first remedial investigation studies began shortly after in 1984 in conjunction with the responsible party ARCO.

Background Soil Lead Levels: Background levels for the soils in Opportunity, Mill Creek, Warm Springs and Anaconda were established by sampling the surrounding unaffected communities of Helena Valley, Philipsburg, Townsend and Livingston. The background lead level range was estimated at 18 ppm to 70 ppm.

Soil Lead Levels Prior To Cleanup: Mill Creek 12 ppm to 2,910 ppm; Anaconda 28 ppm to 1,510 ppm; Opportunity 24 ppm to 5,760 ppm; Warm Springs 12 ppm to 297 ppm.

Action Levels: Arsenic was used as the indicator contaminant; action levels were set at 250 pm for Arsenic.

Guidance Level: Action levels were not set for lead.

Remedy Description

Between 1991 and 1992, arsenic-contaminated soils were removed in the Anaconda Yards Time Critical Removal Action. Soil samples from this area show lead levels in the soil to be elevated, reaching a maximum level of 60,000 ppm below waste piles and ranging from 28 ppm to 1,510 ppm in residential soils. Arsenic was classified as the top priority contaminant and action

levels were set for the clean up of arsenic in three Anaconda neighborhoods (Teresa Ann Terrace, Elkhorn Apartments and Cedar Park Homes). The Teresa Ann Terrace neighborhood had approximately 35 yards remediated. The yards in these neighborhoods had the top 18 inches of contaminated soil removed and replaced with 2 inches of lime rock overlain with 16 inches of clean soil. In yards that were developed, topsoil and sod were replaced and soil was seeded in any undeveloped yards.

In the initial stages of the Anaconda site investigation it also became evident that the community of Mill Creek was severely impacted by the Smelter. Children from Mill Creek had elevated urinary arsenic levels and high levels of arsenic and lead were found in the soil. In 1986, families from Mill Creek were temporarily relocated then permanently relocated in the fall of 1988, because of the close proximity to the Ananconda Smelter and the possibility of recontamination. ARCO bought most of the property from home owners in this town Although soil lead levels ranged between 16 ppm to 2650 ppm, action levels were set only for arsenic in this area.

In 1996, the EPA selected a final remedy for addressing all the remaining residential and commercial/industrial soils throughout the entire site. Major components of the remedy included: cleaning residential soils that exceeded the soil arsenic action level of 250 ppm by removal and replacement efforts as well as covering the ground with vegetation or other protective barriers. Many other remedial actions followed concerning Flue Dust, the Old Works/East Ananconda Development Area, the Arbiter Plant and the Old Works Stabilization Removal Action and others are still waiting on remedy decisions.

Lead was never directly addressed with clean up action levels because arsenic was used as the indicator contaminant and it was assumed that by removing soil contaminated with high levels of arsenic that lead would also be removed. Many of the roads in Anaconda and the surrounding towns have high concentrations of arsenic. There is some fear that residential yards or other hot spots for lead will be missed if the clean up process fails to address those areas, but in general most lead levels fall below 1000 ppm and elevated lead levels are associated with elevated arsenic levels.

EPA is currently contemplating initiating a general educational program with the county to address the risks of arsenic as well as preventative and protective measures families can take to avoid exposure.. EPA is also currently formulating plans with the county to implement institutional controls.

ASARCO GLOBE PLANT SITE

Site Description

The ASARCO Inc, Globe Plant site is located in a mixed industrial, commercial, and residential area known as Globeville, near the South Platte River, in Adams and Denver Counties. In 1886, smelting operations began in order to separate impurities from gold, silver, lead and copper. The plant was converted in 1901 to lead smelting, then replaced by arsenic trioxide production from 1921-1926. Cadmium production began in 1926, and at the present time, the Globe Plant produces high-purity metal alloys as well as specialty metals. Elevated lead and arsenic levels have contaminated the soil near the plant. Clean up of the soils began in the summer of 1994 and are scheduled to continue through 1998.

Background Soil Lead Level: The upper limit for soil lead background levels was determined to be 413 ppm.
Soil Lead Level Prior to Cleanup: NA
Action Levels: Action levels for lead were set at 500 ppm for residential areas.

Remedy Description

According to the Record of Decision (ROD) remedial action was required in any area of the community soils where contaminant levels exceeded 500 ppm of lead. A buffer clean up area was established and remediation was provided upon request of the property owners for those areas exceeding the arsenic action level (70 ppm). It is likely that soil cleanup in the buffer area for arsenic also resulted in the clean up of lead.

An extensive sampling effort took place to verify contaminant levels in areas where previous samples indicated action levels were exceeded. Schools, day care centers and parks were given priority, but sampling was also available to property owners.

Excavating, capping, exposure controls and or deep tilling were used as appropriate in order to reduce the health risk of exposure to contaminated soils. The minimum level for excavation and capping was at least 12 inches of depth. Vegetable garden soils were excavated and refilled or covered to a minimum depth of 18 inches of soil.

A bilingual public information, education and awareness program was implemented in the area surrounding the plant. The purpose of the program is to inform citizens in the area of levels of risk, how risk is incurred and what they could/can expect form cleanup activies, as well as practices and procedures to reduce risk of potential exposure. This effort is primarily directed towards parents and children.

CALIFORNIA GULCH (Leadville, Colorado)

Site Description

The California Gulch Site is located in the town of Leadville, approximately 120 miles from Denver, Colorado. Mining began in this area in 1859 when miners worked the gulch seeking gold, silver, copper, zinc, magnesium and lead. The miners extracted the minerals which eroded from their original bedrock and were deposited in the gulch. Once surface ores were exhausted, an extensive system of underground mines was developed. In addition to the mines, approximately 42 smelters were located throughout Lake County, built to separate the lead and silver from the host rock. Both the smelter slag and tailings waste are significant contributors to elevated soil lead levels.

The Yak Tunnel is another prominent feature in Leadville, spanning more than four miles it served as a drain to the mining district. Approximately 210 tons of metals are discharged per year and are then recovered by the American Smelter and Refining Complany (ASARCO) treatment plant.

The EPA, the State of Colorado and the various responsible parties have reached an agreement concerning the clean up efforts for the lead in soils and acid mine drainage for the 18 square plus mile mining district. The Site has been divided into twelve Operable Units to facilitate the management and clean up efforts. In 1983 the Site was listed on the National Priorities List.

Background Soil Lead Levels: 50 - 150 ppm
Soil Lead Levels Prior to Clean Up: South Border of town and the Lake fork Trailer Park have a level ranging from 2000 to 3500 ppm. West Park and the Turquoise Lake area have soil lead levels < 2000 ppm. Stringtown ranges from 2000 to >3500 ppm.
Action Level: Proposed level is set at 3500 ppm
Guidance Standards: IEU/BK risk assessment model would set level at 1400 ppm for residential soil. After factoring in community involvement and willingness to participate as well as other location specific factors the action level was set at 3500 ppm.

Remedy Description:

In 1990, ASARCO was ordered to design, build and operate the Yak Treatment Plant to improve water quality. At the same time EPA worked with the various responsible parties on several removal actions on the worst areas of the site. Removal actions conducted under Superfund Emergency Response Actions enabled EPA to contain and control more than 350,000 yards of contaminated soil and mine processing wastes.

Clean up efforts are now concentrating on consolidating and capping mine piles to prevent exposing people to metals through inhalation or ingestion of contaminated sediments and soil, water and food. Four waste rock piles have been removed from residential areas, with an expected total of 12 piles to be removed. Thus far, thirty individual properties have been cleaned under voluntary sampling and removal actions.

ASARCO, along with the local government, has initiated a pilot project titled, "Kids First." This program was developed as an alternative to site-wide residential soil removal. The Kids First Program is a voluntary program designed to reduce children's exposure to lead and provide related information to the community. Along with providing education about risks and

prevention of lead poisoning, the program also performs blood monitoring . All sources of lead exposure are addressed within Kids First: lead based paints, lead in soil, lead in pipes, lead from the smelters and dust in homes. Currently, 70 % - 75 % of the children in Lake County take part in the Kids First program educational activities and have blood lead levels monitored. Children in Leadville have been found to have elevated blood lead levels, but recent studies are showing these levels to decrease.

EAGLE MINE (Gilman,.Colorado)

Site Description

The Eagle Mine Site is a large abandoned mining and milling facility located on the edge of the Eagle River, near Minturn, Colorado. The boundaries of the site are defined by the areas of past mining activity between the towns of Red Cliff and Minturn. The miners began working the Eagle Mine ore deposits along the River in the 1880s searching for gold and silver. The mine later developed into a primarily zinc-mining operation, leaving elevated levels of lead, zinc, arsenic, cadmium and copper in the soil. The impacts of the mining extend downstream possibly as far as Gysum, Colorado. The 235 acre Eagle Mine Site includes the Eagle Mine Workings, the town of Gilman, the mine tailings pond areas, Rex Flats, Rock Creek Canyon, and waste rock and roaster pile areas. The site is bordered by the White River National Forest which includes the Holy Cross Wilderness Area. Particles from the largest tailings piles were originally thought to be a cause for concern because the pile is located near a middle school and residences. Contanimants have also posed a threat to fish populations, other aquatic life, groundwater, drinking wells and wetland areas.

Background Soil Lead Levels: Soil samples were collected in the Cross Creek Wilderness area to determine background levels for Minturn. Lead levels ranged from 10.2 ppm to 49.7 ppm, averaging 27.8 ppm. Gilman background levels ranged from 6.7 ppm to 230 ppm.
Soil Lead Levels Prior to Cleanup: Minturn Soil Samples ranged from 5.1 ppm to 1,180 ppm, averaging 92.2 ppm. Gilman soil samples ranged from 6.7 ppm to 18,300 ppm, averaging 1,410 ppm.
Action Level: No action level was set as soils were not determined to pose a threat or risk to human health.
Guidance Standard: NA

Remedy Decription:

The Colorado Department of Public Health and Environment (CDPHE) and the responsible party, formely Paramount Communications, Inc., now Viacom, implemented a cleanup plan (Consent Decree/Remedial Action Plan) in 1988. The agreement included: plugging the mine portals to flood the mine workings; removal of roaster piles and tailings from Rex Flats, the pipeline corridor; capping and temporary groundwater pumping; and setting compliance objectives for mine water, ground water, vegetation and soils. In 1989 and early 1990 evidence of difficulties in acommplishing the tasks appeared and amendments to the Remedial Action Plan were made. In 1991, EPA filed suit against the responsible parties for Clean Water Act violations

and announced it would conduct a Feasibility Study Addendum to compliment the large effort underway by the State of Colorado.

In 1992, EPA concluded that in addition to previous efforts another risk assessment needed to be conducted on the Site due to wind-blown deposits of metals into Minturn and the nearby Middle School. Soils samples were not found to differ dramatically from background levels and no action was taken. Additional soils screening was initiated in 1992, and the abandoned town of Gilman was separated from the remainder of the Site in order to expedite the Record of Decision process. Elevated lead levels and other contaminants were found on this site, but because Gilman is an abandoned town a risk assessment was performed only to determine the potential threat to a trespasser. The selected remedy for this site was implementing institutional controls to reduce the threat of exposure by limiting access to the area. The proximity of the town of Gilman to Vail coupled with Vail's proposed expansion increase the chance of future development in the Gilman area. The selected remedy also proposed that if future development is to take place, a full risk assessment should be done addressing the risks if people were to live on the site full time.

EAST HELENA (East Helena, Montana)

Site Description

The East Helena Site is located in the community of East Helena. Lead and zinc smelting operations took place in the area for over 100 years depositing contaminants into the Helena Valley. Approximately 1,600 people live within a half mile of the site in East Helena and about three miles to the west is the city of Helena with approximately 35,000 people. Air, shallow ground water and soil have all been found to be contaminated with arsenic, cadmium and lead.

The site was listed on the National Priority List in 1984 and the EPA has worked with the state and the potentially responsible party ASARCO in cleanups both on the plant site and in the surrounding communities. The Smelter continues to operate today and is regulated under the Resource Conservation and Recovery Act (RCRA) Program. In January of 1998, ASARCO and EPA agreed to a multimillion dollar settlement for RCRA violations. The settlement specifies a Supplemental Environmental Program and an Environmental Management System for the smelter operation. RCRA remains as the regulatory authority for all of the site except the soils.

Background Soil Lead Levels: NA
Lead Levels Prior to Cleanup: NA
Action Levels: 1000 ppm
Guidance Standard: NA

Remedy Description

This site has been addressed in four stages: initial actions and three long term cleanup phases. In 1991 an expedited cleanup action began in order to remove contaminated soils from residential areas, parks, playgrounds, streets and alleys. This action included the replacement of over 650 residential yards by ASARCO between 1991 to 1996. Studies done by ASARCO between 1987 and 1989 found local livestock, crops and soil contamination exposed by leakage, drainage and contact with contaminated process ponds, surrounding lakes, and water treatment facilities. These activities are part of a long term remedy now underway. ASARCO is still in the process of conducting further studies to evaluate soil contamination and a final decision is due in 1998.

KENNECOTT SOUTH (Copperton, UT)

Site Description

The Kennecott South site includes the Bingham Mining District in the Oquirrh Mountains of Utah and is located about 25 miles southwest of Salt Lake City. In the early 1860's mining activities began in the area and over the years many mills and smelters covered the landscape of this site. Historic mining operations included processing gold, silver, lead and zinc. A large open pit mine still continues to operate today in Bingham Canyon.

The majority of wastes were deposited in the creeks, flood plains and valley slopes where they were eroded and carried downstream. Elevated levels of lead and arsenic have been found in the channels of Bingham Creek and Butterfield Creek. Neighborhoods were built on the flood plains in this area, placing residents at risk from contaminants. Acid wastes from the leaching of wastes have also contaminated the principal ground water aquifer underlying the site, covering more than 77 square miles.

Kennecott Utah Copper Company (Kennecott) and the Atlantic Richfield Company (ARCO) are the potentially responsible parties at this site and have begun cleanup activities of mine wastes, smelter wastes, mill tailings, surface water and ground water. In 1994, EPA proposed listing the Kennecott South site on the National Priorities List (NPL). In 1995, EPA, Kennecott and the state of Utah entered into a Memorandum of Understanding that specifies that Kennecott will continue the cleanups and defers final listing on the NPL.

Background Soil Lead Levels: 20 - 50 ppm
Soil Lead Levels Prior to Cleanup: Bingham Creek Phase I, Bingham Creek Phase II, Bingham Creek Phase III, and Herriman
Action Levels: Bingham Creek Phase I level set at 2500 ppm. Bingham Creek Phase II level set at 2000 ppm. Bingham Creek Phase III action level set at 1100 ppm. In Herriman an action level of 1200 ppm was set for a soil lead level.
Guidance Standards: NA

Remedy Description

In 1990, EPA became involved with the Kennecott site and in conjunction with the State of Utah discovered that residences were built on former flood plains that were contaminated with

mine wastes (with high concentrations of lead and arsenic). Several studies of the site have been performed to determine the nature and volume of contamination.

Immediate cleanups taking place on the site include nine separate subsites. The subsites which have been completed include:

- Bingham Creek Residential Neighborhoods; Bingham Creek Channel; Large Bingham Reservoir; Butterfield Mine Waste Rock; Lark Tailings, Mine Waste Rock & Wetlands; South Jordan Evaporation Ponds; and Anaconda Tailings.

The Bingham Creek Residential Neighborhoods subsite was found to have surface soils containing elevated concentrations of lead. This subsite was addressed in three separate phases. A removal and replacement of surface soils was performed and the cleanup was finished in 1995. In the first phase, approximately 56 properties, encompassing 42 acres of residential land were found to be contaminated with lead in excess of 2500 ppm and at least 21% of these properties had lead levels ranging from 5000 ppm to 17,960 ppm. A cleanup action level of 2500 ppm was set for removing soil (18 inches or less) in residential areas.

A second phase of the cleanup of Bingham Creek was initiated after more sampling showed lead concentrations were as high as 12000 ppm in residential soils. This removal action pertains to the soils in the channel banks and undeveloped floodplain areas that are directly adjacent to residences. There is evidence that children use the channels and undeveloped lots for recreation (digging tunnels, bike riding, etc.) There was also some concern that contaminants could wash downstream. Soils were removed and replaced if there was evidence that soil lead levels exceeded the action level of 2000 ppm. Revegetating, grading and contouring as well as creating spillways, rip-raps and stilling basins were also methods employed as necessary to control run-off, exposure, and erosion. Phase Three of the Bingham Residential area addressed the removal of the remaining soils. Examination of the total database from site evaluations revealed at least 25 unremediated properties with samples exceeding the original action level of 2500 ppm. This action addressed residential soils at or exceeding lead concentrations of 1100 ppm.

Cleanup is currently underway at two subsites: Butterfield Canyon and Herriman Residential Neighborhoods. In Herriman, sampling was conducted between 1994 and 1997 which detected lead and arsenic contamination in Butterfield Creek and residential soils. EPA determined that a cleanup level of 1200 ppm for lead in soil would be protective of human health. EPA has thus far sampled over 193 properties and recommended cleanup for 75 homes. Cleanup consists of removing soils, providing clean soil and restoring the yard to its previous state.

Soils were also tested in the towns of Coppertown and Magma but lead levels centered around background and no human health risks were found.

MIDVALE SLAG (Midvale, UT)

Site Description

The Midvale Slag site is located adjacent to the Sharon Steel Site and is just south of Salt Lake City, UT. The site covers about 530 acres in Midvale, UT and contains millions of tons of hazardous wastes. The site is a former copper and lead smelting facility that began in 1871 and continued until 1958. From 1918 to 1928, approximately 400,000 tons of lead were produced. Although the smelter is no longer there, the contaminants are widely dispersed and large piles of wastes and slag remain on site. Today, over 2.5 million tons of slag remain on site. The site was listed on the National Priority List in 1991.

Background Soil Lead Levels: 85 -500 ppm
Soils Lead Levels Prior to Cleanup: 120 ppm - 2300 ppm
Action Level: 650 ppm
Guidance Standard: NA

Remedy Description

Midvale Slag is divided into two operable units, a northern and a southern zone. Operable unit one includes the residential areas such as the Winchester Estates area and an area in which future residential development is expected. In this area 16 residential yards required cleanup (soil removal and replacement up to 18 inches in depth). In the currently undeveloped residential area, a permeable soil cover was placed over soils to control dust and wind blown lead particles. Institutional controls were also imposed on the undeveloped commercial zoned areas so that future property use will be industrial/commercial unless additional remediation to residential soil occurs.

MURRAY SMELTER (Murray, Utah)

Site Description

From 1872-1949 the Murray Smelter processed lead and silver ores from Utah and neighboring Western states. Over seventy years of lead smelting is seen in the impacts to ground water and soils at the site which are contaminated with lead and arsenic. After the smelter closed in 1950, diverse businesses purchased or leased the property, and currently the site is a mixture of heavy industrial land use and trailer parks. The site includes the former operational areas of the Murray Smelter and surrounding residential and commercial areas where the smelter's stack emissions have impacted the environment. In January of 1994 EPA proposed that the site be added to the National Priority List; however, it has not been formally listed.

Background Soil Lead Levels: not known
Soil Lead Levels Prior to Cleanup: Surface soil 538-9548 ppm
Action Level: Soil lead levels should not exceed 1200 ppm

Guidance standards: Current land use, future land use, ground cover, institutional controls and a small blood lead level study were all used to determine the likelihood of exposure. These factors were then combined with the IEU/BK model for evaluating risks of lead to children aged 0-7. This process developed a range of acceptable risk for soil lead levels to be between 600 - 1200 ppm, the upper limit was chosen as the action level.

Remedy Description

The first response action was a time critical removal of soils located in and adjacent to the playground area at the Grandview Trailer Park. These soils were contaminated with lead and arsenic at levels considered by EPA to be unacceptably high. The area was then backfilled with clean fill. All other residential soils that contain levels of lead exceeding remediation levels will be removed to a depth of 18 inches and replaced with clean fill.

RICHARDSON FLATS TAILINGS (Park City, UT)

Site Description

The Richardson Flats Tailings site is located one and one-half miles northeast of Park City, Utah and covers approximately 160 acres in a small valley. The Keetley Ontario mine and other metal mining operations owned by United Park City Mine generated tailings that include arsenic, cadmium, copper, lead, mercury, silver and zinc. In 1986, air sampling documented the release of these contaminants into the air. Approximately 4500 people live within four miles of the site and could possibly be adversely affected. The site was proposed for addition to the National Priority List in February of 1992.

Background Soil Lead Levels: not known
Soil Lead Levels Prior to Cleanup: not known
Action Level: none
Guidance Standards: na

Remedy Description

In the early 1990's, United Park City Mine performed some work on the site to cover the tailings pond. EPA performed a removal assessment in 1992, but concluded that there was no need for an emergency response action. The site is currently being addressed for long term remedial cleanup of the entire site as people may be at risk from direct contact with contaminants from the site or inhaling dust particles contaminated with site related chemicals. This site may be effected by the winter Olympics in 2002 which will be held in Park City, Utah.

SANDY SMELTER (Sandy, Utah)

Site Description:

The Sandy Smelter site is located in Historic Sandy City. Four separate lead smelters operated in the area dating back to the late 1800. A high school and a middle school, the City Hall, as well as parks and residences all currently occupy land either adjacent or on top of the former smelters. Early smelting processes are known to be highly inefficient, losing as much as 60 percent of metals out of the smoke stacks through air emissions and flue dust. Slag was also commonly disposed on properties surrounding the smelters.

Results of surface soil samples taken by the Utah Department of Transportation in 1991 showed elevated levels of lead and arsenic. This prompted the 1992 environmental study by the EPA. Phase I identified the perimeter of the high lead concentration areas and Phase II focused on collecting samples from the four smeler sites. This data showed that various locations including twenty nine residential properties had lead levels in excess of 4000 ppm.

Background Soil Lead Level: NA
Soil Lead Level Prior to Cleanup: NA
Action Level:1400
Guidance Standard: Based on soil sampling, instituitional controls, blood lead level monitoring, and the risk assessment.

Remedy Description:

A Removal action took place in 1993 to address residential yards (45 yards) with soil lead levels over 4000 ppm. Soils were removed and replaced with clean soil to a depth of 18 inches. In June of 1997 a working group comprised of representatives of Utah, EPA, Sandy City, ASARCO, and the Salt Lake City/County Health Department met to consider whether removal actions have been sufficiently protective and to explore implementability, community accetance, and State acceptance of options. An action level for of 1800 for soil removal was first proposed and then later revised to 1400.

SHARON STEEL CORPORATION (Midvale, Utah)

Site Description

The Sharon Steel site is located in Midvale, Utah and includes a mill that operated from 1906 to 1971. The site and surrounding area is a mix of agricultural, commercial and residential land use. During the mill's operation, lead, copper and zinc were extracted from mineral ore. The wastes generated from this process resulted in an estimated 10 million tons of mine tailings on the site, some uncovered tailings piles were 50 feet deep. The tailings are fine grained and the piles resemble sand dunes.

In 1982, an environmental health problem was first suspected when the Health Department was notified that local residents were gathering the tailings and using them for children's sandboxes and gardens. The tailings were tested and found to have high concentrations of lead, cadmium, and arsenic. A public education campaign was launched to warn residents. In

addition, other investigations were performed, revealing that over a 570 acre area of the City of Midvale downwind of the mill site had contaminated soils.

The site was proposed for the National Priorities List in 1984 and listed in 1990. The EPA divided the site into two operable units and in 1990 and 1993 released two separate Records of Decision. Operable Unit One refers to ground water, the mill site and its tailings. The second operable unit refers to the residential soils contaminated by the mill.

Background Soil Lead Level: Background soil concentrations for this area are less than 100 ppm lead.
Soil Lead Levels Prior to Cleanup: The surface soils had lead concentrations ranging from 33.8 ppm to 7,210 ppm.
Action Level: Soils contaminated with over 500 ppm of lead will trigger removal and soils used for gardening will be remediated to the action level of 200 ppm.
Guidance Level: NA

Remedy Description

In 1989, interim clean up actions began, including fencing, stabilizing the banks of the Jordan River and spraying the tailings to reduce dust. The Record of Decision for residential soils was released in 1990 as part of a two step remedy to address the most immediate threat to public health. It consists of the excavation of the contaminated soil and storage of these soils at the mill site. The major components of this remedy include:

1.) Removal of contaminated soils and associated vegetation to the action level of 500 ppm lead. Soils being used for gardening will be remediated to the level of 200 ppm lead.
2.) Clean soil will replace excavated soils back to original ground surface and the area will be revegetated.
3.) Residents will be offered temporary relocation if necessary.
4.) Homes will be tested and cleaned to remove household dust if dust exceeds the action levels for lead, following the outdoor cleanup.
5.) Institutional controls will be implemented to provide special provisions for future construction when removing or replacing existing sidewalks driveways, foundations, etc. which may have contaminated soils beneath them.

Since 1993, more than 600 properties (mostly residential yards) have been cleaned up. In 1995, capping the tailings and reclaiming areas surrounding the tailings piles began and is now essentially complete.

SILVER BOW CREEK/BUTTE AREA (Butte, Montana)

Site Description

The Silver Bow Creek/ Butte Area site begins above Butte and extends westward along Silver Bow Creek and includes the Warm Springs Ponds treatment area. The Silver Bow Creek/ Butte area is part of four contamination areas that are known together as the Clark Fort Basin Sites. All of the sites are National Priority Listed sites. The Silver Bow Creek/Butte site stretches over 40 miles. The creek itself was contaminated after serving as a conduit for mining, smelting and industrial wastes for more than a 100 years. Mine tailings are found deposited along the creek and are dispersed across the entire flood plain. Air particulates, ground water, surface water and soils are all contaminated with arsenic, copper, zinc, cadmium and lead.

Background Soil Lead Levels:
Soil Lead Levels Prior to Cleanup:
Action levels: Butte Priority Soils Time Critical Removal Action set an action level of 2000 ppm. Lead abatement program includes children with residential yards with lead levels over 1200 ppm.
Guidance Standards:

Remedy Description:

The site is being addressed in several stages: immediate actions and seven long term remedial phases focusing on the West Camp/Travona Shaft Area; Warm Springs Ponds; Butte Priority Soils; Berkeley Pit; Rocker Timber Framing and Treating; Streamside Tailings; and Lower Area 1.

The Priority Soils operable unit includes most of the city of Butte and Walkerville in which many residential areas are located in close proximity to the contamination source areas (waste dumps). The first phase for clean up was the Butte Priority Soils Time Critical Removal Action in which hundreds of thousands of cubic yards of lead contaminated soil were removed from waste dumps, railroad beds and other related mine wastes because of their proximity to residential yards, gardens, parks and playgrounds.

In Walkerville contaminated soil was removed from four earthen basements and 23 residential yards. Concrete basements were constructed, and 18 inches of clean fill and sod replaced contaminated soil. In Timber Butte, contaminated soil was removed from two residential yards and replaced with clean soil and vegetation.

Lead abatement programs were set in place by the local government (with oversight by EPA) to address children with elevated blood levels, residential yards with lead levels over 1200 ppm, residential homes with lead drinking pipes, indoor dust contaminated with lead, and interior and/or exterior lead paint.

Remedial and removal actions at waste dump sites, flood plains, along the streamside, etc., are helping to address the potential health threats and limit contamination.

SMELTERTOWN (Salida, Colorado)

Site Description

The Smeltertown Site encompasses several separate historical and operating industrial facilities. Smelting, wood treating and zinc sulfate manufacturing are the three main industrial activities that contributed to the contamination of the 120 acres making up the site.

The lead/zinc smelter operated on the site from the turn of the century until about 1920. During the smelter's operation, hot slag was dumped along the banks of the Arkansas River. Contaminated soils are also associated with the smelter, which covers approximately 80 acres of land. Elevated levels of lead, arsenic, cadmium, copper, zinc and manganese are among the main soil contaminants from the smelter. Beginning in 1924, wood treatment occurred on the site. Railroad ties and other wood products were dipped in creosote and pentachlorophenol. This chemicals were allowed to drip onto the ground and contaminated much of the soil. The CoZinCo facility is currently operated and manufacturing zinc sulfate monohydrate. Areas of contamination around CoZinCo include drum piles, sludge disposal and two wastewater lagoons.

The site has been divided up into three operable units that are directly associated with the source of contaminants. Operable unit one includes the former smelter; operable unit two includes contaminations from the railroad tie treating facility; and operable unit three contains contamination from the CoZinCo. The site was proposed for the National Priorities List in 1992.

Background Soil Lead Levels:
Soil Lead Levels Prior to Clean Up:
Action Level: 500 ppm
Guidance Standards:

Remedy Description:

Investigations for the first operable unit have been completed and an Action Memorandum was released in 1996. EPA expects a final Record of Decision in 1998. The smelter contaminated soils will be consolidated and capped on site. Investigations are currently underway for the company formerly known as Koppers (wood treating company). The State of Colorado is currently overseeing the work conducted by CoZinCo under a RCRA order.

In 1993, a Time Critical Removal Action was prepared to address creosote, heavy metals and other hazardous substances. These include contaminated soil caused by past smelter activities. Samples from residential areas found that 82% of the locations exceeded the 500 ppm guideline level for residential areas, and 36% exceeded the 1000 ppm level for industrial areas. Residential areas were to be assessed and cleaned up to acceptable levels, by backfilling and seeding with native vegetation. All contaminated soils were to be trucked to an interim storage facility somewhere on site, stockpiled and sprayed with a dust suppressant polymer.

SMUGGLER MOUNTAIN (Aspen, Colorado)

Site Description

The Smuggler Mountain site is located in northeastern Aspen, Colorado and is now an inactive silver and lead mining site that was in operation from 1879 to 1918. The site covers approximately 135 acres, of which 116 are residential. The site includes condominium units, mobile home parks, a tennis club, and single family residences. Waste rock, tailings and slag cover much of the site and in many cases development occurred directly over waste piles, or piles have been moved to the sides of developed areas and remain as berms or mounds of contaminated soil. Some contaminated soil has been removed and used for fill in other locations or disturbed by grading. Potential health risks to residents include accidentally ingesting contaminated surface soils (of particular concern for children), inhaling contaminated dust from the soil, or eating vegetables grown in the contaminated soil. The EPA placed the site on the National Priorities List in 1986 and cleanup construction was competed at the site in September of 1996.

Background Soil Lead Level: 200 ppm
Soil Lead Levels Prior to Cleanup: Soil analysis identified lead concentration from 4000 ppm to 65,000 ppm
Action Level: 1986 ROD called for a clean up level of 1000 ppm lead in soils.
Guidance Standard level: recommended by ATSDR/ EPA

Remedy Description

The original Record of Decision (ROD) has been modified many times. The objectives of the 1986 ROD were to isolate waste materials with lead concentrations greater than 1000 ppm by requiring:

1) removal and disposal of soils/tailings with lead concentrations greater than 5000 ppm
2) capping soils with lead concentrations between 1000 ppm and 5000 ppm with 6 to 12 inches of clean soil
3.) monitoring of ground water and providing alternate water supply for residences with wells
4.) operating and maintaining site with regular inspections, and enforcing land use restrictions (known as institutional controls)

During the remedial design, additional technical information showed that implementation was not possible and the ROD was modified in 1989. Concerns from the Aspen community spurred further changes in 1990. These new changes relied more on institutional controls and required the removal of 6 inches of soil in the Hunter Creek condominium areas, and one foot of soil elsewhere. These changes were then repealed based on citizen concern that there was no need for any remedy. Some residents concluded that the cleanup would be more hazardous than living with the health risk at the site. To address the health concerns about lead in the soil, EPA assembled a Technical Advisory Committee (TAC), an independent panel of six nationally recognized lead experts and three technical advisors. The TAC released a report in 1993 which EPA reviewed and eventually went on to enact. The clean up plan consisted of:

1) A blood lead surveillance program for young children.

2) Capping highly contaminated berm areas with clean soil, revegetating and monitoring the soil. The Mollie Gibson Park and other common use areas of exposed mine waste were also to be covered and monitored.
3) Planting vegetable gardens in at least a foot of clean soil, and soil testing is to be made available to residents upon request.
4) Site use/land use changes are to be monitored for potential soil exposure to children.

APPENDIX C:

GIS Maps of Mining and Smelter Sites

GIS Maps

The Environmental Justice Program has developed a GIS mapping tool to help identify areas of EJ concern within a state. The EJ mapping tool will create 8 ½ by 11 inch color maps and demographic reports surrounding either a specific facility or latitude/longitude location within Region VIII. Details on maps include:

Percent Minority	Selected Radius (1/4 mile - 10 miles)	Primary Site Location
Percent Poverty	Block Group Boundaries	RCRA Sites
Tribal Areas	Streams	CERCLA Sites
Towns/Cities	State & US Highways	TRI Sites
Railroads	Interstates	NPDES Discharge Locations
County Boundaries		

To obtain a copy of the EJ Applications maps produced for the sites included within this report please contact Nancy Reish in the Environmental Justice Program at (303) 312-6040.